Assessing how rainfall and other environmental factors affect the level of *E. coli* contamination in two species of bivalve.

Submitted by Charlotte Teague

To the University of Exeter as a thesis for the degree of Masters by Research in Geography, November 2012.

I certify that material in this thesis which is not my own work has been identified and that no material has previously been submitted and approved for the award of a degree by this or any other University.

(Signature)……C Teague……

Abstract

The purpose of this study was to obtain an understanding of the association between environmental variables, particularly rainfall and the faecal contamination of bivalve shellfish. Diffuse pollution is an important source of this contamination, in which the transfer of faecal bacteria from land downstream to coastal waters is exacerbated by the magnitude of rainfall and other environmental factors. Oysters (*Crassostrea gigas*) and mussels (*Mytilus edulis*) were set up on a small intertidal oyster farm that received inputs from two streams draining a headwater agricultural catchment. The oysters/mussels, stream and seawater were sampled under rainfall event and baseline conditions for bacteriological quality using the faecal indicator bacteria *Escherichia coli*. Turbidity (NTU) and total suspended solids (TSS, mgl^{-1}) were also monitored. Further, in situ measurements were recorded which included; temperature (°C), salinity (ppt) flow rate (ms^{-1}) and flow depth (m).

Flow rate, flow depth, turbidity and TSS were significantly correlated with rainfall in both streams and regression analysis showed that the preceding 12 hour rainfall and turbidity could explain 68.3% of the variability of *E. coli* found in stream one ($F = 21.51$, $p = <0.001$), whereas in stream two, preceding 12 hour rainfall and total suspended solids could explain 66.5% of the *E. coli* present ($F = 19.86$, $p = <0.001$). Levels of *E. coli* in the surrounding seawater were significantly correlated with preceding 12 hour rainfall ($R = 0.530$, $p = <0.05$). No significant relationships were found between rainfall and levels of *E. coli* in mussels and seawater ($F = 8.22$, $p = <0.05$). Overall, oysters exhibited higher levels of *E. coli* than Mussels but no significant relationship could be found with environmental variables to explain these elevated *E. coli* values. The data highlights the need for future sampling strategies to be tailored to individual species (Oysters, Mussels or other bivalves) and suggests that several rainfall events are required in order to capture the variability in bivalve response to rainfall through the year.

Contents

List of table and figures
Section One:

Figures

Tables

Section Two:

Figures

Tables